

Wax

THE ALOHA SYSTEM		project: At ATS-1	document no. CCG/G-78	pages: 6 pages
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ALOHA PACKET SYNCHRONIZATION USING A DIGITAL CORRELATOR

The ALOHA ATS-1 terminal uses a digital correlator to obtain packet start time from a 32-bit sync-word preamble located in front of the first bit of the ALOHA packet format. This correlator is called the "Preamble Synchronizer" in our "ATS-1 Packet Preamble Unit," ALOHA drawing number RF 1023.

Basically, the Preamble Synchronizer compares a stored replica of the 32-bit preamble sequence against the latest 32 bits of received data every bit interval period and counts the number of disagreements occurring in each 32-bit match. If the number of disagreements is less than a preset number, synchronization is assumed and the incoming data is gated into the encoder/decoder unit. If the number of disagreements equals or exceeds the preset number, no synchronization is signalled and the matching process is repeated during the next bit-time interval. In order to perform a comparison within one bit-time interval, the receive data and reference registers must be shifted at a speed at least 32 times the incoming bit rate. This is accomplished by gating on a high-speed clock during each bit interval, as shown in drawing RF 1023-03. The clock actually runs for less than one-fourth the data bit interval since the comparison is made during the latter half of the bit interval.

The miss probability and false detection probability of an n-bit sync word are determined from the following equations:

$$Q = \sum_{i=\epsilon+1}^n \binom{n}{i} p^i q^{n-i} \quad (1)$$

$$F = \frac{1}{2^n} \sum_{i=0}^{\epsilon} \binom{n}{i} \quad (2)$$

where: Q = Miss probability

F = False detection probability

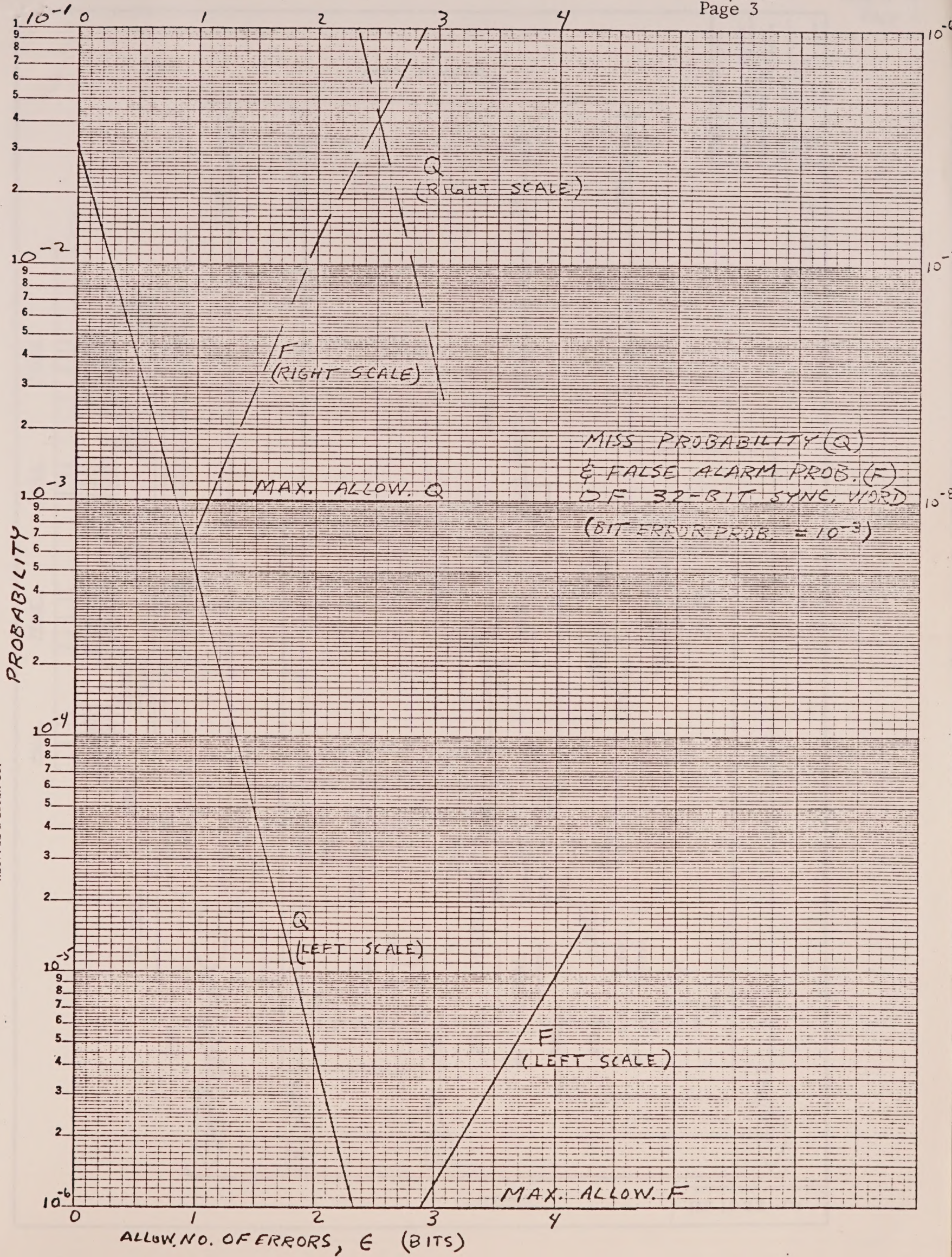
n = Length of sync word

ϵ = Number of errors allowed in sync word

p = Bit-error probability of channel

q = 1 - p

These probabilities have been calculated for the 32-bit sync word used, and have been plotted on the attached graph as a function of the number of error bits allowed. The ALOHA preamble synchronizer is presently set to allow less than three errors. For an expected average channel bit-error rate of 10^{-3} , this setting should provide a miss probability of about 5×10^{-6} and a false detection probability of about 10^{-7} .





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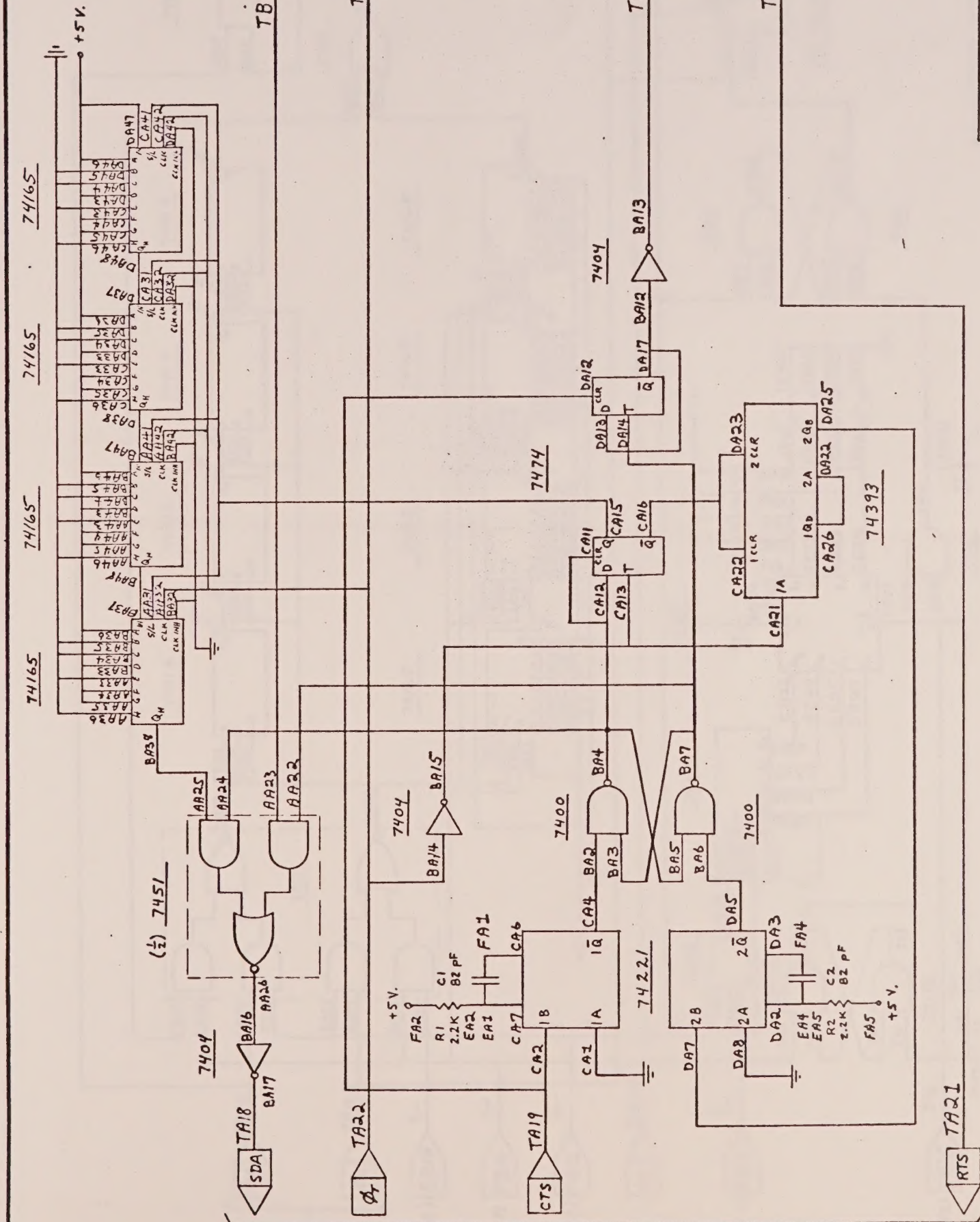
ALOHA System Project,
U. of H.
System: ATS-1 PACKET
PREAMBLE UNIT
Sub-system: PREAMBLE
GENERATOR
Name D. WAY
Date 8/25/75
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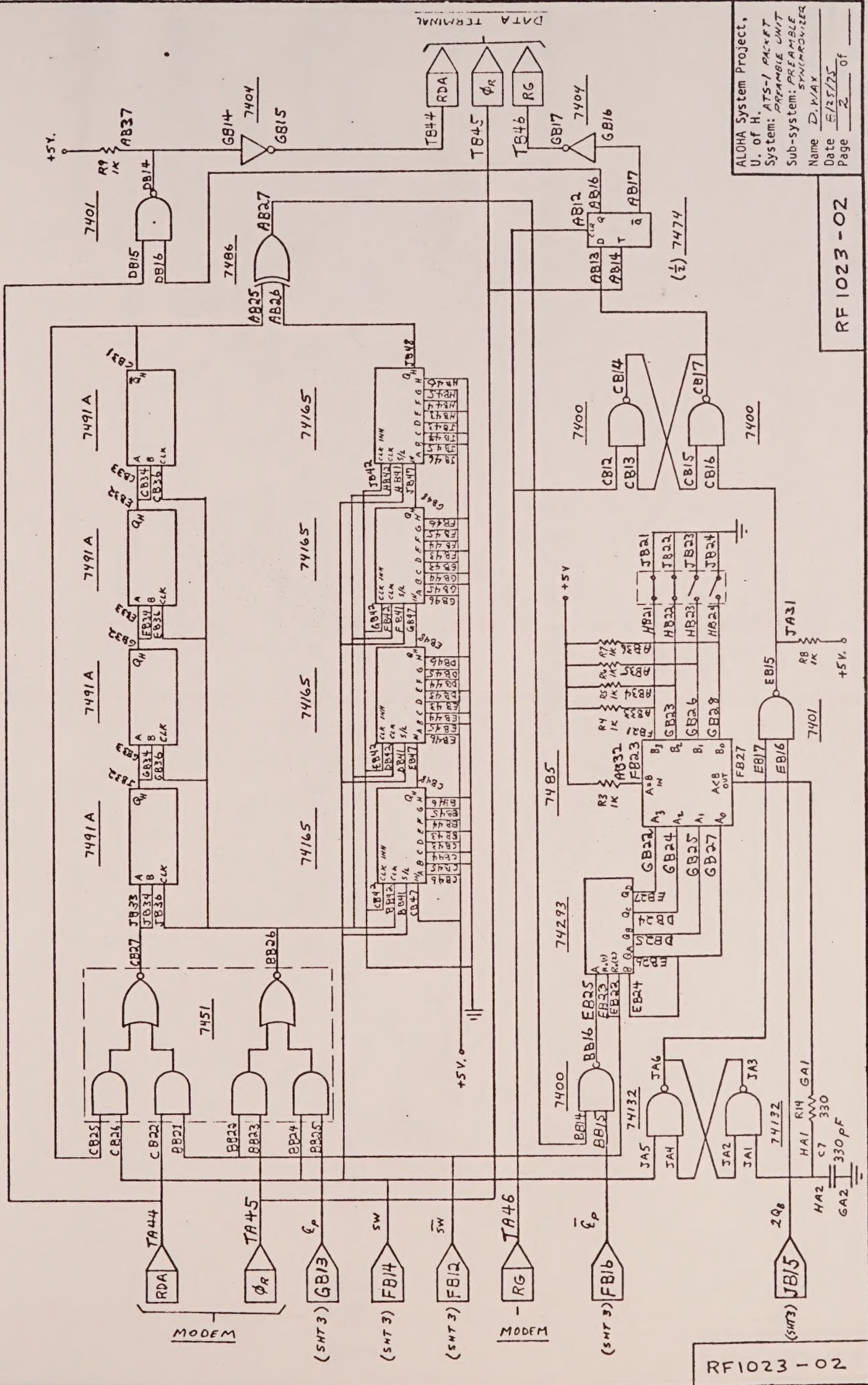
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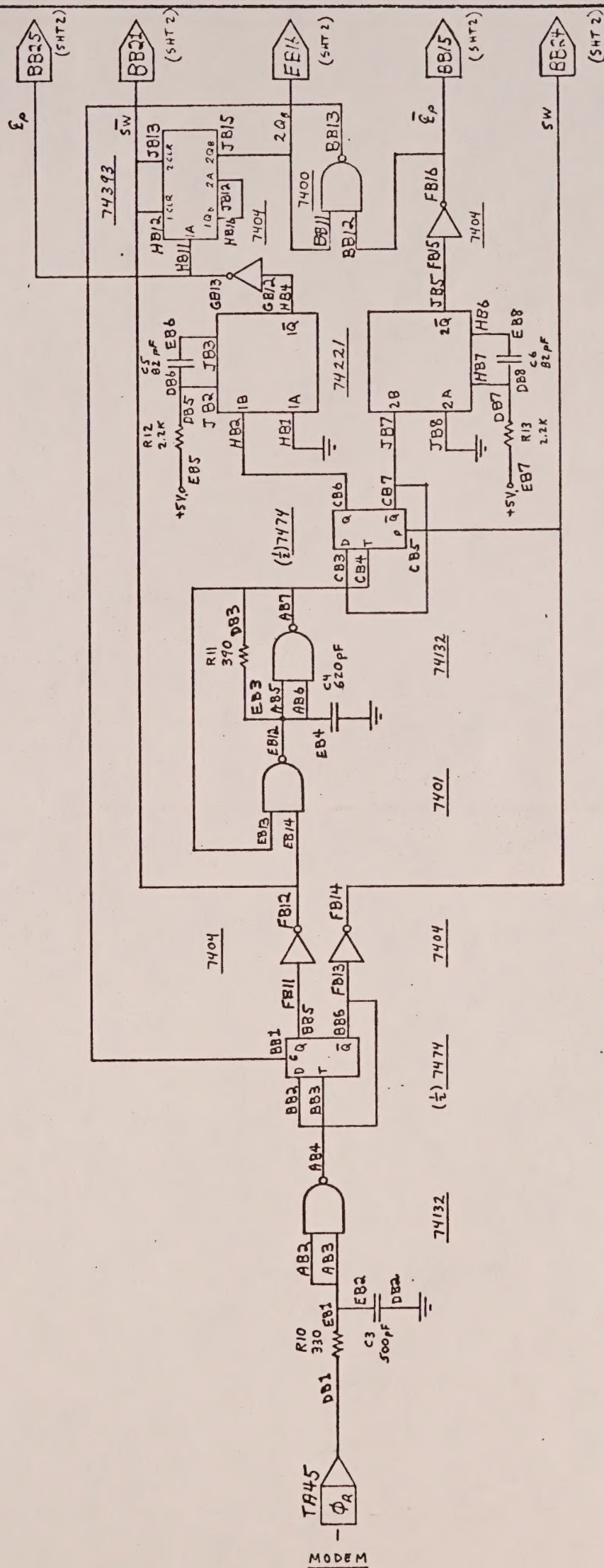
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DATA TERMINAL

MODEM







ALOHA System Project,
U. of H.
System: ATS-1 PACKET
PREAMBLE UNIT
Sub-system: PREAMBLE
SYNCHRONIZER
Name D. IVAX
Date 8/25/78
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